Indiana
Technology Education

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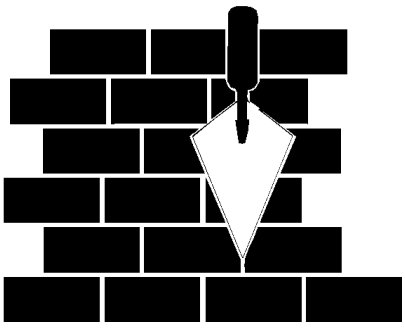
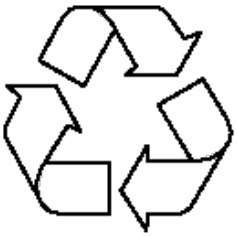
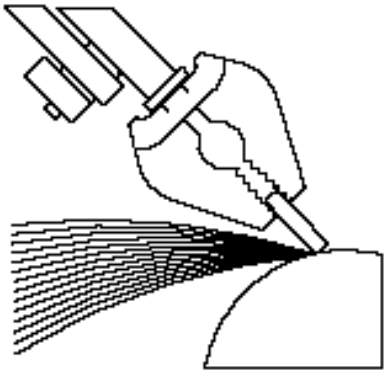




Technology

Introductory–level Course Guide
for Middle School and
Jr. High School Programs



2004 Edition

Technology (M.S. / Jr. High) Guide – 2004 Edition

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Technology – A Foundation

To many people, technology means cell phones, robots, and computers. They see modern technology as the "stuff" that scares the uninformed and may even threaten them with job displacement. Technology to this group is often described as the hardware that enslaves people. To other people technology is the instrument of environmental destruction. Its improper use pollutes the air we breathe and the water we drink. This group often longs to return to a simpler life; less complicated by technological advancements. To still other people technology is the hope for a more comfortable and efficient life. It can feed the hungry, allow individuals to remain in contact with the entire world, and create shelter for the exploding population. Technology is seen as "the answer" to both immediate and future problems.

To some extent all three views are correct. However, to address what people need to know about technology, the term needs clarification. Technology is the product of the human mind and its engineering spirit. The *Standards for Technological Literacy* document (ITEA 2000) notes that technology involves "the generation of knowledge and processes to develop systems that solve problems and extend human potential". Technology is the result of human volition and control. Therefore, all technology has been developed by people to meet people's needs and wants, and is subject to human monitoring.

Today, technology is in evidence everywhere on our planet. Most of the world is concerned about energy, employment in productive enterprises, adequate resources, and the growing mountain of waste. Transportation, shelter, and entertainment are also common themes in all countries and cultures. An understanding of technological concepts is a must for every citizen of our global society.

To introduce technology to young learners, teachers should start with several basic concepts. First these four statements help summarize the concept of "technology":

- Technology is human knowledge.
- Technology uses tools, materials, and systems.
- Application of technology results in artifacts (human-made things) and other outputs (pollution, scrap, etc.).
- Technology is developed by people to modify or control the natural and human-made environments.

These four points suggest that technology is a unique body of knowledge and is among the academic areas that should form the basis for modern education:

- Scientific knowledge describes the laws and principles that govern the natural world and practices used to discover these laws and principles.

- Technological knowledge describes the human-made world and the practices used to design, produce, and use products, structures and systems.
- Humanities knowledge describes the development and use of cultural values, beliefs, and ethics.
- Descriptive knowledge describes the ways people used signs and symbols (such as the English language or math) to convey information and ideas.

All students need a balance of these four types of knowledge as they progress through grades K-12 (i.e., formal schooling). In addition, students with specific career goals require special emphasis in one or more of these areas.

Education about the practical world is almost as old as humankind. Early experiences were almost totally trade oriented. In the last 100+ years educators have recognized that broad, general (not career specific) education about tools and materials is important. Out of this belief a new program took form as manual training and later industrial arts. However, these subjects drew their content almost totally from the skilled trades and focused on learning “basic skills” and constructing take-home projects.

The discipline of Technology Education has emerged to replace the skill oriented, technical instruction of industrial arts. Today, the educational focus is on technological literacy, or one's ability to use, manage, assess, and understand technology. National content standards for technological literacy, released in April 2000, help identify and clarify this mission.

Technological literacy is gained by having students study the creation, use, and behavior of tools, machinery, materials, and technical means and the behavior of these resources in relation to humans, their societies, and the environment. The typical goals of technology education programs include helping all learners . . . .

- Know and appreciate the importance of technology
- Be able to safely use appropriate tools, materials, processes, and technical concepts
- Apply design and problem-solving techniques
- Be able to assess the influence of technology on people, society, and the environment
- Make wise career and consumer choices
- Better understand the forces that shape the future

To reach these goals, a T.E. program should address the knowledge of technology (or cognitive standards), the action of technology (doing), and the appropriateness of technology (managing and assessing). Often, the focus on specific problems and opportunities relate to major elements in the designed world. Content standards for

the study of technology (released April 2000) include these topics:

- ✔ Agricultural and related bio-technologies
- ✔ Construction technology
- ✔ Energy and power technology
- ✔ Information / communication technology
- ✔ Manufacturing technology
- ✔ Medical technology
- ✔ Transportation technology

The majority of the suggested content found in the Standards for Technological Literacy document can be found in the Indiana Technology Education curriculum guides. For instance, multiple courses related to manufacturing and transportation are found in the Indiana program. At the same time, concepts related to agricultural, medical / health, and certain energy topics are highlighted in greater detail in other academic areas in Indiana's schools.

The Indiana Industrial Technology Education curriculum was first developed and implemented in the 1980s. A formal name change also took place in the mid-1990s (removing the term “Industrial” from the title). Program support booklets and the upper–level course guides were revised following the release of the national standards in April 2000. All of these changes have resulted in a new, broader-based curriculum which support the content and benchmarks found in the Standards for Technology Literacy: Content for the Study of Technology (ITEA, 2000).

The present Indiana Technology Education program is based on the following vision for Technology Education in the State of Indiana:

> *All students in Indiana will apply their knowledge in appropriately designing, selecting, and using current and future technologies and in assessing their impacts.*

The foundation of this vision is the view that technology involves applying resources to design, produce, use, and manage products and services that extend the human potential for improving and controlling the natural and human-made environment. The vision statement also communicates that all students regardless of gender, ethnicity, career goals, or abilities can profit from a study of technology. The ultimate goal for all Indiana students is technological literacy.

In addition, this vision statement leads directly to the definition of technology education as a discipline in today's schools. Technology Education is:

> *An action-based program for all students to learn how to design, produce, use, and assess the impacts of products and services that extend the human potential to improve and control the natural and human-made environment.*

This perspective leads to a unique set of fundamental objectives for the Indiana T.E. curriculum. These objectives note that each student who participates in the technology education program will develop an understanding of technology as a

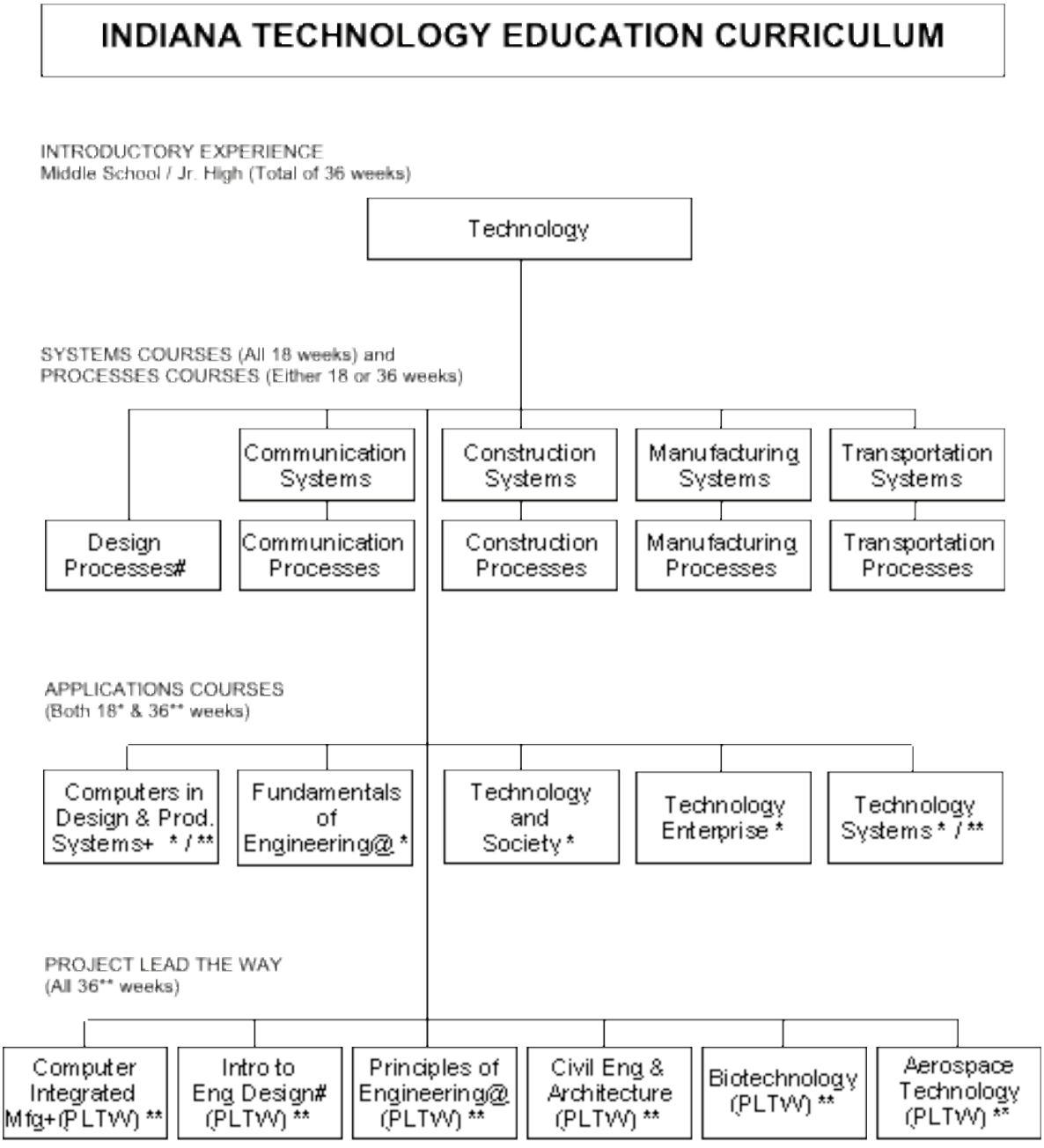
system in the global context by developing an ability to . . . .

- Design technological products, services, and systems
- Use tools, machines, materials, and energy to produce products, services, and systems
- Select appropriate technology to solve problems and meet opportunities
- Appropriately use technology to extend human potential to improve our environment
- Assess the impacts of technology on individuals, society, and the environment
- Use appropriate personal and interpersonal skills to participate in a technological society

The definition of technology and the fundamental objectives provide a foundation for a set of technology courses for Indiana schools. Twenty one course titles have been approved by the State Board of Education, a total which includes six Technology Education-related courses in the Project Lead The Way (PLTW) program. Note: Special training is required to implement the PLTW curriculum.

Courses in the Indiana program are divided into different categories:

- ✔ **Introducing Technology** - A broad middle school / junior high school experience that can be offered over two or three years (depending on the school's schedule). A total of 36 weeks of instruction is included in the guide.
- ✔ **Technology Systems** - Four high school level courses which present the principles and activities associated with technology in the unique context of communication, construction, manufacturing, and transportation. Each of these classes is one semester in length.
- ✔ **Technological Processes** - High school courses that focus on the production or the “doing” actions involved in design, communication, construction, manufacturing, and transportation technologies. Students are exposed to more sophisticated content, software, and machinery at this level. Five of these course guides specify both 18 and 36 weeks of instructional experiences.
- ✔ **Technology Applications** – Includes several specialized technology education courses which are designed to address the unique needs and interests of today's secondary students. Depending on the class, the course guides include 18 and / or 36 weeks of instruction. Note: There is not a separate course guide for the Computers In Design and Production Systems class, as this course title is for locally developed courses.
- ✔ **Project Lead The Way Program** - Several course titles in the engineering-based PLTW program have been approved for Indiana's secondary schools. These classes cover advanced math, science, and technological content. The course titles are shown in the program model on the next page.



NOTES: All six Project Lead The Way (PLTW) courses are full year (36 week) experiences. Students may earn credit for either a PLTW course in Design#, Engineering@, and Computers+ or the equivalent Indiana T.E. course, but not both. In addition, PLTW course titles of **Digital Electronics** and **Engineering Design and Development** are approved titles for Indiana schools (and appear under the Multidisciplinary Category of the Indiana Dept. of Education guidelines).

The Instructional System

Each of the courses in the Indiana Technology Education Curriculum was designed to provide a hands-on / minds-on experience for students as they explore the many facets of technology. This guide is part of a carefully designed instructional system. This system includes many important components: Indiana and national content standards, the teacher, the students, a textbook, curriculum guides, lesson plans and evaluation systems, apparatus, instructional media, and activities.

The Teacher

The teacher plays the primary role in the system. This role entails being a curriculum developer. The instructor develops presentations and demonstrations, prepares for discussions, selects activities, and develops the evaluation system. Care should be taken to cover all the major concepts contained in this guide to insure that the coverage of the subject is comprehensive. At all times resist “picking and choosing” only units and activities that are the most interesting, most familiar, or the easiest to implement. However, as long as the suggested content is addressed, you are encouraged to revise or replace activities with your own activities.

As a technical expert, the teacher gives formal presentations, demonstrates the use of equipment, and leads class discussions that reinforce the subject matter. Safety instruction and the implementation of teaching / learning activities are the responsibility of the instructor.

Basically, the teacher is “the” instructional manager. Managers plan, schedule, direct, and control activities. The teacher (perhaps in cooperation with other teachers and the students) plans the instruction by identifying the instructional goals. The activities to help reach these goals are scheduled. Through presentations and activities students are directed through the course content. Finally, the student's work is assessed through various forms of evaluation. Since evaluation instruments should measure success in reaching specific course goals, the instruments used to assess student achievement are best prepared by the teacher of the actual course.

Students

The target population (for this course) are students in the middle school or junior high grades. The students will often work in small groups. Their responsibilities include reading the textbook assignments, doing the worksheets as homework, entering into discussions, and completing the teacher-directed activities. Students are often able and may request to do additional activities.

[CONTINUED]

Technology Textbooks

A textbook should be selected for the course and each student should have one. A textbook contains the body of knowledge about technology. It also includes a description of unique terms and covers complex principles. Illustrations often help content "come to life". Each student should be expected to use the textbook (and any related media) throughout the course.

Curriculum Guide

The curriculum guide is to be used to help school staff in planning for instruction. The introduction of the guide lays a foundation for technology and technology education, describes the Indiana curriculum, and presents the instructional system for the course with suggestions on how to use it.

The remainder of each curriculum guide describes the instructional units that make up the course. Every unit consists of an introduction, objectives, a suggested calendar, and descriptions for the actual lessons (presentations, content outlines, discussions, and activities) that are outlined in the calendar. Specific content is marked with bullets and check marks (i.e., a " ● " or a " ✔ " in the guides. Also, note how content is cross–referenced to existing state and national standards.

Instructional Resources

It takes many resources to conduct a successful, efficient technology education program. Apparatus, videotapes, software, etc. are noted throughout the guides, and all of these resources will help contribute to a meaningful course.

Daily Instructional & Evaluation Plan

Planning of daily activities and the implementation of an on–going evaluation system are the teacher's responsibility, and rightfully so. Each teacher should adapt activities and presentations so they help students develop the identified concepts within local conditions. The curriculum guide was designed to help you, the local professional, present a relevant course. The time frame is flexible as many schools have a traditional schedule while other programs have a "block" schedule in their district.

Activities

The real strength of instruction in technology–based programs is the daily use of hands on / minds on activities. Students learn best when they can make "connections" between concepts and actions. Instructional activities, whether in a

classroom or laboratory, help young learners about complex systems and devices. It's also “more fun” to learn through doing!

There are hundreds of ways to introduce content in a safe, creative, and interesting manner. The first time you offer a new technology–based class, it's suggested that the activities in the course guides be implemented. Then, based on the rate of success in your program, you might chose to use alternative activities when offering the same course another time. Note: An alternative activity might be preferable based on differences in class size, availability of resources, time, or other factors. Or, sometimes it's nice to just “do something different” in your program.

"Technology" – The Middle School or Jr. High Introductory Course

This course is designed to introduce students to the exciting world of technology. For this course, technology is defined as a body of knowledge and actions, used by people, to apply resources in designing, producing, and using devices, products, structures, and systems to extend the human potential for controlling and modifying the natural and human–made (modified) environment.

This unique perspective communicates that “technology” is a system and its major actions involve the processes of designing, producing, evaluating, and using technology. These technological actions are universal for all technologies. They can be viewed from many approaches (i.e., communication / information, construction, manufacturing, medical, transportation, etc.). In today's complex world, almost all aspects of daily life involve one or more technologies.

Additionally, technology can be viewed in terms of societal applications. Technology can be applied by an individual in a hobby or charitable setting, or by an economically driven group (business / industry). Many applications of technology are profit–driven. Finally, technology can be viewed from a “systems” perspective (which is a combination of elements or parts that work in an orderly, predictable way to accomplish a desired goal).

The systems model is a way to view the dynamic phenomena we call technology. However, applying a systems model to current technical means provides a somewhat narrow viewpoint. All technology impacts and is impacted by historical, economic, social, cultural, and environmental contexts. Only when technology is viewed in relationship with the setting in which it operates, can a realistic understanding be developed.

In summary, the responsible development and use of technology moves through a three-phase approach involving three separate systems – the design system, the production system, and the consumption or application system. The outputs are

used by people to meet individual or group needs and wants. At each step of this design-produce-use process, impacts are felt both within the system and in the larger personal, societal, and environmental arenas.

This course guide specifies content for the study of technology and its related actions in a total of 36 weeks of instruction (the current state recommendation for minutes of instruction in an introductory experience in technology education). If implementing the course in a Middle School, the nine units should be divided into three 60-day sections. If the implementing school uses a Junior High schedule, the content can be split into two 90-day sections. Refer to the chart on page 13 for the suggested sequence.

Textbooks

The following textbooks have been approved by the Indiana Board of Education as appropriate resources for the introductory experience in Technology Education (during the Spring 1999 approval cycle):

Brusic, Falls, & Kuetemeyer. (1999). Technology: today and tomorrow. Blacklick, OH: Glencoe / McGraw–Hill. ISBN 0-02-658570-7

Harms & Swernofsky. (1999). Technology interactions. Blacklick, OH: Glencoe / McGraw–Hill. ISBN 0-02-838779-1

Pierce & Karawtka. (1999). Introduction to technology. Blacklick, OH: Glencoe / McGraw–Hill. ISBN 0-02-831275-9

Soman & Swernofsky. (1997). Experience technology: Communication, production, transportation. Blacklick, OH: Glencoe / McGraw–Hill. ISBN 0-02-838719-8

Wright & Smith. (1998). Understanding technology. Tinley Park, IL: Goodheart-Willcox Publishing Company. ISBN 1-56637-374-3

Course Objectives

Upon completing this course, each student should be able to:

- Describe technology
- Explain technology as a series of developing, producing, using, and assessing actions
- Use problem-solving processes to develop technological products
- Use common technological practices to communicate information, manufacture products, construct structures, transport people and materials
- Describe the impact technology has on individuals, society, and the environment and, conversely, how people and the environment influence the applications of technology
- Use a variety of resources safely in a classroom and laboratory setting

Technology – Suggested Calendar

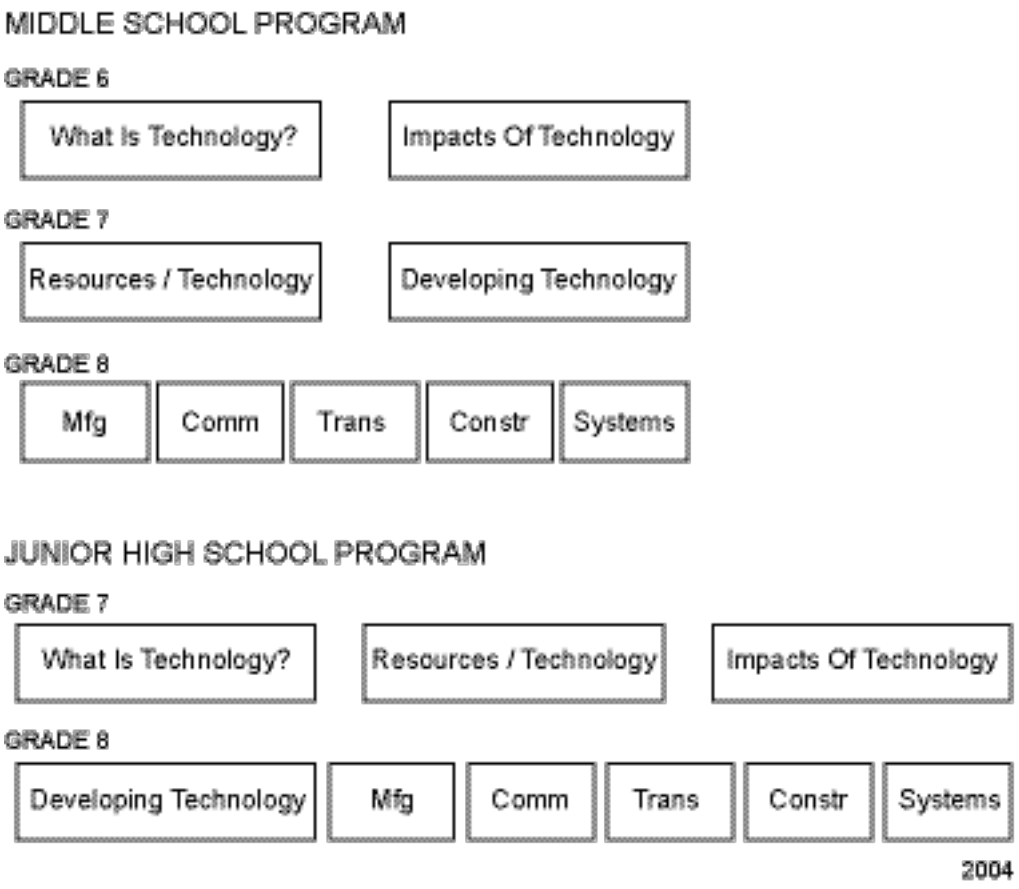
UNIT	UNIT TITLE AND CONTENT	# OF DAYS
1	What Is Technology? Technological development Designing, producing, and using modern technologies	30
2 (or 3*)	Impacts Of Technology Assessing technology Personal, environmental, and societal impacts	30
3 (or 2*)	Resources In Technology Types of resources Nature of resources	30
4	Developing Technology Design process Developing and testing solutions Specifying solutions	30
5	Manufacturing Technology Materials and processing techniques Types of production systems Designing and producing products	12
6	Communication / Information Technology Communication via technical means Graphic and electronic media	12
7	Transportation Technology Modes of transportation Vehicular and support systems	12
8	Construction Technology Types of structures Designing and using structures	12
9	Technology & Systems Interdisciplinary nature of technology	12

NOTE: This calendar is designed the be separated into three 12-week classes for middle school programs (6th, 7th, and 8th grades) or split into two 18-week classes for jr. high schools (7th and 8th grades). *Note how Units 2 and 3 are switched for the Junior High scenario.

Using The Guide

This guide contains nine separate units that give guidance in planning and implementing a series of two or three experiences related to technology. To gain maximum benefit from the guide, read it cover-to-cover before you start planning your individual classes. Teacher flexibility is a key to the program, but many useful suggestions can be found in this manual.

This guide is different from other curriculum guides in the Indiana T.E. program, as it specifies an experience that can be delivered over a two or three year period. The suggested calendar is designed to be separated into three 12-week classes for the middle school grades (6th, 7th, and 8th) or two 18-week classes for the junior high school grades (7th and 8th). The suggested middle school program includes Units 1 and 2 in 6th grade, Units 3 and 4 in 7th grade, and the final five units in the 8th grade. For a junior high school program, cover Units 1 through 3 in the seventh grade and the remaining six units in the 8th grade. NOTE: Unit 2 and Unit 3 are reversed in the junior high model, it makes sense to cover “resources” prior to “impacts” in that scenario.



Academic Standards

Coursework in the Indiana T.E. program is directly linked to a variety of national standards. The next few charts illustrate the relationship of this class to state and national guidelines. In preparing these charts, each lesson or activity in the guide was reviewed to determine exactly what students would learn or experience throughout the course. A comparison was made between (a) instructor and student efforts and (b) various approved content standards. For example, an activity where a student designs a new civil structure would involve numerous academic areas, math and design documentation being two obvious themes. Checkmarks appear on the charts in the appropriate units.

These charts were prepared as if the suggested content and activities outlined in this guide were used throughout the middle school experience. If you substitute a lesson or activity, naturally that may add or subtract checkmarks. One suggestion is that instructors routinely update content and select new activities that help address more (rather than fewer) content standards.

Correlation With The Indiana Standards For Technological Literacy*

General Technological Concepts	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9
Standard 1. Systems model of tech.	✘	✘			✘	✘	✘	✘	✘
Standard 2. Understand technology	✘	✘	✘	✘	✘	✘	✘	✘	✘
Standard 3. Technological contexts	✘	✘	✘		✘	✘	✘	✘	✘
Standard 4. Design / use technology	✘	✘	✘	✘	✘	✘	✘	✘	✘
Standard 5. Identify needs		✘	✘	✘	✘	✘	✘	✘	✘
Standard 6. Create solutions		✘	✘	✘	✘	✘	✘	✘	✘
Standard 7. Evaluate solutions		✘		✘	✘	✘	✘	✘	✘
Designing & Producing Technology	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**	**Unit 5**	**Unit 6**	**Unit 7**	**Unit 8**	**Unit 9**
Standard 8. Specify solutions	✘	✘	✘	✘	✘	✘	✘	✘	✘
Standard 9. Select resources	✘	✘	✘	✘	✘	✘	✘	✘	✘
Standard 10. Select processes	✘	✘	✘	✘	✘	✘	✘	✘	✘
Using & Assessing Technology	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**	**Unit 5**	**Unit 6**	**Unit 7**	**Unit 8**	**Unit 9**
Standard 11. Using systems	✘	✘	✘	✘	✘	✘	✘	✘	✘
Standard 12. Selecting devices	✘	✘	✘	✘	✘	✘	✘	✘	✘
Standard 13. Operate device & system	✘	✘	✘	✘	✘	✘	✘	✘	✘
Standard 14. Repair & service tech	✘	✘			✘		✘	✘	
Standard 15. Obsolescence		✘		✘	✘		✘	✘	
Standard 16. Impacts of technology	✘	✘	✘	✘	✘	✘	✘	✘	✘
Standard 17. Entrepreneurship			✘	✘		✘	✘	✘	✘

*NOTE: Refer to the INDIANA T.E. CONTENT STANDARDS BOOKLET for a full explanation of the current Indiana Standards for Technological Literacy.

Correlation With the TFAA (National Technology Content) Standards

Knowing The Nature Of Technology	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9
1. The characteristics & scope	✘	✘	✘	✘	✘	✘	✘	✘	✘
2. Core concepts of technology	✘	✘	✘	✘	✘	✘	✘	✘	✘
3. Technological connections	✘	✘	✘	✘	✘	✘	✘	✘	✘
Knowing About Technology & Society	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**	**Unit 5**	**Unit 6**	**Unit 7**	**Unit 8**	**Unit 9**
4. Societal effects of technology	✘	✘	✘	✘	✘	✘	✘	✘	✘
5. Technology & the environment	✘	✘	✘				✘	✘	
6. Role of technology in society	✘	✘	✘	✘	✘	✘	✘	✘	✘
7. Technology & history	✘	✘	✘			✘	✘	✘	✘
Knowing About Design	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**	**Unit 5**	**Unit 6**	**Unit 7**	**Unit 8**	**Unit 9**
8. Attributes of design	✘	✘	✘	✘	✘	✘	✘	✘	✘
9. Engineering design	✘	✘	✘	✘	✘		✘	✘	✘
10. R&D, invention & problem solving	✘	✘	✘	✘	✘		✘	✘	✘
Abilities For A Technological World	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**	**Unit 5**	**Unit 6**	**Unit 7**	**Unit 8**	**Unit 9**
11. Apply design processes	✘	✘	✘	✘		✘	✘	✘	✘
12. Use & maintain technology	✘	✘	✘	✘	✘	✘	✘	✘	✘
13. Impacts of technology	✘	✘	✘	✘	✘	✘	✘	✘	✘
Abilities For The Designed World	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**	**Unit 5**	**Unit 6**	**Unit 7**	**Unit 8**	**Unit 9**
14. Medical technologies		✘	✘		✘				✘
15. Agriculture & biotechnology	✘	✘	✘						✘
16. Energy & power technology	✘	✘	✘	✘			✘	✘	✘
17. Information & communication tech	✘	✘	✘	✘		✘	✘	✘	✘
18. Transport technology	✘	✘	✘	✘			✘	✘	✘
19. Manufacturing technology	✘	✘	✘	✘	✘	✘	✘	✘	✘
20. Construction technology	✘	✘	✘	✘			✘	✘	✘

*This is dependent upon the specific lectures, discussions, and activities used in the course.

Helpful resources in regard to content standards and technology-based courses . . .

International Technology Education Association. (2000). *Standards for technological literacy: Content for the study of technology*. Reston, VA: Author (Technology For All Americans Project). ISBN 1-887101-02-0

International Technology Education Association. (2003). *Advancing excellent in technological literacy: Student assessment, professional development, and program standards*. Reston, VA: Author. ISBN 1-887101-04-7

International Technology Education Association. (2004). *Measuring progress: A guide to assessing students for technological literacy: Student assessment, professional development, and program standards*. Reston, VA: Author. ISBN 1-887101-03-9

Pearson, G. & Young, A.T. (eds.). (2002). *Technically speaking: Why all Americans need to know more about technology.* Washington, DC: National Academy Press. ISBN 0-309-08262-5

Crosswalks With Indiana Academic Standards

Science Contexts	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9
Nature of science and technology	✘	✘	✘	✘	✘	✘	✘	✘	✘
Scientific thinking	✘		✘	✘			✘		✘
Physical setting	✘	✘						✘	✘
Living environment	✘	✘	✘				✘		✘
Mathematical world	✘	✘	✘	✘	✘	✘	✘	✘	✘
Historical perspectives	✘	✘	✘			✘	✘	✘	✘
Common themes	✘	✘	✘	✘	✘	✘	✘	✘	✘
Mathematics Contexts	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**	**Unit 5**	**Unit 6**	**Unit 7**	**Unit 8**	**Unit 9**
Number Sense	✘	✘	✘	✘	✘	✘	✘	✘	✘
Computation	✘		✘	✘		✘	✘	✘	✘
Algebra and functions							✘		
Geometry								✘	
Measurement	✘	✘	✘	✘	✘	✘	✘	✘	
Statistics, data analysis, & probability			✘	✘			✘		✘
Problem solving	✘	✘	✘	✘	✘	✘	✘	✘	✘
Language Arts Contexts	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**	**Unit 5**	**Unit 6**	**Unit 7**	**Unit 8**	**Unit 9**
Reading	✘	✘	✘	✘	✘	✘	✘	✘	✘
Writing	✘	✘	✘	✘	✘	✘	✘	✘	✘
Listening	✘	✘	✘	✘	✘	✘	✘	✘	✘
Speaking	✘	✘	✘	✘	✘	✘	✘	✘	✘

Additional resources in regard to standards-based instruction . . .

Wiggins, G. & McTighe, J. (1998). *Understanding by design*. Alexandria, VA: Assoc. for Supervision and Curriculum Development. ISBN 0-87120-313-8

Websites that address content standards . . . .

Academic Standards in Indiana's Public Schools
http://www.doe.state.in.us/standards/welcome.html

Content Standards and the Project Lead The Way program
http://www.pltw.org/aindex.htm

Standards related to Computers and Instructional Technology
http://cnets.iste.org/

Technology For All Americans (TFAA) Project
http://www.iteawww.org/TAA/TAA.html

The National Academies (engineering, technology, etc.)
http://www.nationalacademies.org/

Instructional Resources

The following textbooks, reference materials, and resources are helpful when preparing to implement this introductory–level course . . . . .

Brain, M. (1990). How stuff works. New York: Hungry Minds.

Burke. (1985). The day the universe changed. Boston, MA: Little, Brown, & Co.

Fouke, J. (ed.) (2000). Engineering tomorrow: Today's technology experts envision the next century. New York: Institute of Electrical and Electronics Engineers, Inc.

International Technology Education Association. (2000). Standards for technological literacy: Content for the study of technology. Reston, VA: Author (Technology For All Americans Project).

Hjorth, L., Eichler, B., Khan, A., & Morello, J.A. (2000). Technology and society: A bridge to the 21st century. Upper Saddle River, NJ: Prentice Hall.

Kanter. (1995). World class: Thriving locally in the global economy. New York, NY: Simon and Schuster.

Langone, J. (1999). How things work: Everyday technology explained. Washington, D.C: National Geographic Society.

Lidwell, W., Holden, K, & Butler, J. (2003). Universal principles of design. Gloucester, MA: Rockport Publishers.

Martin, E. (ed.). (1995). Foundations of technology education. 44th CTTE Yearbook. Peoria, IL: Glencoe/McGraw-Hill.

Pearson, G. & Young, A.T. (eds.). (2002). Technically speaking: Why all Americans need to know more about technology. Washington, DC: National Academy Press.

Technology for all Americans: A rationale and structure for the study of technology. (1996). Reston, VA: Int'l Technology Education Association.

The Technology Teacher. The official journal of the International Technology Education Association.

Waetjen, W. (1989). Technological problem solving. Reston, VA: International Technology Education Association.

Wright, M. & Patel, M. (eds.). (2000). Scientific American: How things work today. New York: Crown Publishers.

Zolli, A. (ed.). (2003). Tech TVs catalog of tomorrow. Indianapolis, IN: Que Publishing.